

IN THE CLAIMS:

The following is a complete listing of the claims. This listing replaces all earlier versions and listings of the claims.

Claim 1 (currently amended): A method of classifying a digital image, said method comprising the steps of:

segmenting the digital image into a plurality of substantially homogeneous regions;

processing the plurality of regions to provide a ~~labeled~~ region adjacency graph for the digital image, the ~~labeled~~ region adjacency graph representing spatial adjacency between the plurality of regions of the digital image[[,]];

labeling at least one of the regions of the ~~labeled~~ region adjacency graph ~~being associated~~ with one of a plurality of predetermined semantic labels to provide a labeled region adjacency graph;

analyzing the labeled region adjacency graph to identify one or more predetermined patterns of the semantic labels in the labeled region adjacency graph; [[and]]

assigning one ~~or more~~ of a plurality of predetermined stereotypes to the ~~digital image~~ labeled region adjacency graph according to [[each]] at least one identified predetermined pattern of the semantic labels in the labeled region adjacency graph, ~~wherein~~ each of the predetermined stereotypes ~~corresponds~~ corresponding to at least one of the predetermined patterns such that the assigned stereotype describes the plurality of regions of the digital image and represents a classification of the digital image ~~based on each predetermined pattern identified in the labeled region adjacency graph; and~~

storing the assigned stereotype and the digital image in one or more databases of digital images, wherein the digital image is retrievable from the one or more databases using the assigned stereotype.

Claim 2 (canceled)

Claim 3 (previously presented): The method according to claim 1, wherein identification of the predetermined pattern is based on a size of one or more regions of the digital image.

Claim 4 (previously presented): The method according to claim 1, wherein identification of the predetermined pattern is based on an adjacency of the regions.

Claim 5 (previously presented): The method according to claim 1, wherein identification of the predetermined pattern is based on semantic label content of the region adjacency graph.

Claim 6 (previously presented): The method according to claim 1, wherein identification of the predetermined pattern is based on a mean color of one or more regions of the digital image.

Claim 7 (previously presented): The method according to claim 1, wherein the plurality of stereotypes are stored in an association lookup table.

Claim 8 (previously presented): The method according to claim 1, wherein the stereotypes are represented in a hierarchal arrangement.

Claim 9 (currently amended): The method according to claim [[7]] 1, wherein each of the stereotypes has a hierarchical path.

Claim 10 (previously presented): The method according to claim 1, wherein the region adjacency graph is provided by analyzing contextual data associated with one or more regions of the digital image.

Claim 11 (previously presented): The method according to claim 10, wherein the contextual data comprises information generated by one or more separate sources of the information.

Claim 12 (previously presented): The method according to claim 11, wherein a corresponding portion of the contextual data is obtained from a temporal region of interest for each source of the information.

Claim 13 (previously presented): The method according to claim 1, further comprising the step of providing metadata associated with the digital image, wherein the metadata includes the stereotypes of the digital image.

Claim 14 (previously presented): The method according to claim 13, wherein the metadata includes a hierarchical path associated with the respective stereotype of each digital image.

Claim 15 (previously presented): The method according to claim 14, wherein the hierarchical path is stored with a respective stereotype as a metadata object which is associated with a respective image object.

Claim 16 (previously presented): The method according to claim 14, wherein the hierarchical path is stored as a referenced lookup table.

Claim 17 (canceled)

Claim 18 (currently amended): An apparatus for classifying a digital image, said apparatus comprising:

segmenting means for segmenting the digital image into a plurality of substantially homogeneous regions;

processing means for processing the plurality of regions to provide a ~~labeled~~ region adjacency graph for the digital image, the ~~labeled~~ region adjacency graph representing spatial adjacencies between the plurality of regions of the digital image[[,]];

labeling means for labeling at least one of the regions of the ~~labeled~~ region adjacency graph ~~being associated~~ with one of a plurality of predetermined semantic labels to provide a labeled region adjacency graph;

analyzing means for analyzing the labeled region adjacency graph to identify one or more predetermined patterns of the semantic label in the labeled region adjacency graph; [[and]]

assigning means for assigning one ~~or more~~ of a plurality of predetermined stereotypes to the ~~digital image~~ labeled region adjacency graph according to [[each]] at least one identified predetermined pattern of the semantic labels in the labeled region adjacency graph, ~~wherein~~ each of the predetermined stereotypes ~~corresponds~~ corresponding to at least one of the predetermined patterns such that the assigned stereotype describes the plurality of regions of the digital image and represents a classification of the digital image ~~based on each predetermined pattern identified in the labeled region adjacency graph; and~~

storage means for storing the assigned stereotype and the digital image in one or more databases of digital images, wherein the digital image is retrievable from the one or more databases using the assigned stereotypes.

Claim 19 (canceled)

Claim 20 (previously presented): The apparatus according to claim 18, wherein identification of the predetermined pattern is based on a size of one or more regions of the digital image.

Claim 21 (previously presented): The apparatus according to claim 18, wherein identification of the predetermined pattern is based on an adjacency of the regions.

Claim 22 (previously presented): The apparatus according to claim 18, wherein identification of the predetermined pattern is based on semantic label content of the region adjacency graph.

Claim 23 (previously presented): The apparatus according to claim 18, wherein identification of the predetermined pattern is based on a mean color of one or more regions of the digital image.

Claim 24 (previously presented): The apparatus according to claim 18, wherein the plurality of stereotypes are stored in an association lookup table.

Claim 25 (previously presented): The apparatus according to claim 18, wherein the stereotypes are represented in a hierarchal arrangement.

Claim 26 (currently amended): The apparatus according to claim ~~[[24]]~~ 18, wherein each of the stereotypes has a hierarchical path.

Claim 27 (previously presented): The apparatus according to claim 18, wherein the region adjacency graph is provided by analyzing contextual data associated with one or more regions of the digital image.

Claim 28 (previously presented): The apparatus according to claim 27, wherein the contextual data comprises information generated by one or more separate sources of the information.

Claim 29 (previously presented): The apparatus according to claim 28, wherein a corresponding portion of the contextual data is obtained from a temporal region of interest for each source of the information.

Claim 30 (previously presented): The apparatus according to claim 18, further comprising metadata providing means for providing metadata associated with each digital image, wherein the metadata includes the stereotypes of each digital image.

Claim 31 (previously presented): The apparatus according to claim 30, wherein the metadata includes a hierarchical path associated with the respective stereotypes of each digital image.

Claim 32 (previously presented): The apparatus according to claim 31, wherein the hierarchical path is stored with a respective stereotype as a metadata object which is associated with a respective image object.

Claim 33 (previously presented): The apparatus according to claim 31, wherein the hierarchical path is stored as a referenced lookup table.

Claim 34 (canceled)

Claim 35 (currently amended): A computer program product comprising a computer readable medium having a computer program recorded for classifying a digital image, said computer program product comprising:

a segmenting module, for segmenting the digital image into a plurality of substantially homogeneous regions;

a processing module, for processing the plurality of regions to provide a ~~labeled~~ region adjacency graph for the digital image, the ~~labeled~~ region adjacency graph representing spatial adjacency between the plurality of regions of the digital image[[,]];

a labeling module, for labeling at least one of the regions of the ~~labeled~~ region adjacency graph ~~being associated~~ with one of a plurality of predetermined semantic labels to provide a labeled region adjacency graph;

an analyzing module, for analyzing the labeled region adjacency graph to identify one or more predetermined patterns of the semantic labels in the labeled region adjacency graph; [[and]]

an assigning module, for assigning one ~~or more~~ of a plurality of predetermined stereotypes to the ~~digital image~~ labeled region adjacency graph according to [[each]] at least one identified predetermined pattern of the semantic labels in the labeled region adjacency graph, ~~wherein~~ each of the predetermined stereotypes ~~corresponds~~ corresponding to at least one of the predetermined patterns such that ~~each of the predetermined stereotypes is associated with at least a plurality of said semantic labels and~~ the assigned stereotype describes the plurality of regions of the digital image and represents a classification of the digital image ~~based on each predetermined pattern identified in the labeled region adjacency graph; and~~

a storage module, for storing the assigned stereotype and the digital image in one or more databases of digital images, wherein the digital image is retrievable from the one or more databases using the assigned stereotype.

Claim 36 (canceled)

Claim 37 (previously presented): The computer program product according to claim 35, wherein identification of the predetermined pattern is based on a size of one or more regions of the digital image.

Claim 38 (previously presented): The computer program product according to claim 35, wherein identification of the predetermined pattern is based on an adjacency of the regions.

Claim 39 (previously presented): The computer program product according to claim 35, wherein identification of the predetermined pattern is based on semantic label content of the region adjacency graph.

Claim 40 (previously presented): The computer program product according to claim 35, wherein identification of the predetermined pattern is based on a mean color of one or more regions of the digital image.

Claim 41 (previously presented): The computer program product according to claim 35, wherein the plurality of stereotypes are stored in an association lookup table.

Claim 42 (previously presented): The computer program product according to claim 35, wherein the stereotypes are represented in a hierarchal arrangement.

Claim 43 (currently amended): The computer program product according to claim [[41]] 35, wherein each of the stereotypes has a hierarchical path.

Claim 44 (previously presented): The computer program product according to claim 35, wherein the region adjacency graph is provided by analyzing contextual data associated with one or more regions of the digital image.

Claim 45 (previously presented): The computer program product according to claim 44, wherein the contextual data comprises information generated by one or more separate sources of the information.

Claim 46 (previously presented): The computer program product according to claim 45, wherein a corresponding portion of the contextual data is obtained from a temporal region of interest for each source of the information.

Claim 47 (previously presented): The computer program product. according to claim 35 further comprising a metadata providing module for providing metadata associated with each digital image, wherein the metadata includes the stereotypes of each digital image.

Claim 48 (previously presented): The computer program product according to claim 47, wherein the metadata includes a hierarchical path associated with the respective stereotype of each digital image.

Claim 49 (previously presented): The computer program product according to claim 48, wherein the hierarchical path is stored with a respective stereotype as a metadata object which is associated with a respective image object.

Claim 50 (previously presented): The computer program product according to claim 48, wherein the hierarchical path is stored as a referenced lookup table.

Claim 51 (canceled)

Claim 52 (currently amended): A method of classifying a digital image signal, said method comprising the steps of:

segmenting the digital image into a plurality of substantially homogeneous regions;

processing the plurality of regions to provide a ~~labeled~~ region adjacency graph for the digital image, the ~~labeled~~ region adjacency graph representing spatial adjacency between the plurality of regions of the digital image[[,]];

labeling at least one of the regions of the ~~labeled~~ region adjacency graph ~~being associated~~ with one of a plurality of predetermined semantic labels to provide a labeled region adjacency graph;

providing a plurality of predetermined stereotype classifications, each of the stereotype classifications with corresponding to at least one predetermined pattern, wherein each predetermined pattern comprises:

(i) a set of labeled regions; or

(ii) a set of labeled regions and corresponding adjacency information;

analyzing the labeled region adjacency graph to identify the presence of one or more patterns of labeled regions in the labeled region adjacency graph;

for each pattern of labeled regions identified in the labeled region adjacency graph as matching at least one of the predetermined patterns, selecting one of the stereotype classifications from the plurality of stereotype classifications based on the matching; [[and]]

assigning the selected stereotype classification to the labeled region adjacency graph such that the assigned stereotype describes the plurality of regions of the digital image and represents [[as]] a classification of the digital image; and

storing the one or more assigned stereotype classifications and the digital image in one or more databases of digital images, wherein the digital image is retrievable from the one or more databases using the one or more assigned stereotype classifications.

Claim 53 (canceled)

Claim 54 (previously presented): The method according to claim 52, wherein the digital image is classified on the basis of semantic label content of the labeled region adjacency graph.

Claim 55 (previously presented): The method according to claim 52, wherein a stereotype is assigned to the digital image signal on the basis of the adjacency of a set of regions with specified labels in the labeled region adjacency graph.

Claim 56 (previously presented): The method according to claim 52, wherein a stereotype is assigned to the digital image signal on the basis of the size of one or more regions with a specified label in the labeled region adjacency graph.

Claim 57 (previously presented): The method according to claim 52, wherein a stereotype is assigned to the digital image signal on the basis of a label which represents a mean color of one or more regions in the labeled region adjacency graph.

Claim 58 (previously presented): The method according to claim 52, wherein a stereotype is assigned to the digital image signal on the basis of a label which represents a mean color texture of one or more regions in the labeled region adjacency graph.

Claim 59 (previously presented): The method according to claim 52, wherein the plurality of stereotypes are stored in an association lookup table.

Claim 60 (previously presented): The method according to claim 52, wherein the stereotypes are represented in an hierarchical arrangement.

Claim 61 (previously presented): The method according to claim 60, wherein each of the stereotypes has a hierarchical path.

Claim 62 (previously presented): The method according to claims 52, wherein each of the stereotypes is represented by one of a plurality of icons.

Claim 63 (currently amended): The method according to claims 52, ~~[[where]]~~ wherein the digital image is ~~stored in a database of digital images and wherein~~ the digital image can be retrieved retrievable from the database one or more databases using a keyword representing a stereotype.

Claim 64 (currently amended): The method according to claim 52, ~~[[where]]~~ wherein the digital image is ~~stored in a database of digital images and wherein~~ the digital image can be retrieved retrievable from the database one or more databases using an icon representing a stereotype.

Claim 65 (currently amended): The method according to claim 52, ~~[[where]]~~ wherein the digital image is ~~stored in a database of digital images and wherein~~ the digital image can be retrieved retrievable from the database one or more databases using either a keyword or icon representing a generalization, or broader version, of a stereotype.

Claim 66 (currently amended): An apparatus for classifying a digital image signal, said apparatus comprising:

segmenting means for segmenting the digital image into a plurality of substantially homogeneous regions;

processing means for processing the plurality of regions to provide a ~~labeled~~ region adjacency graph for ~~at least part of the digital image signal~~, the ~~labeled~~ region adjacency graph representing spatial adjacency between the plurality of regions of the digital image[[,]];

labeling means for labeling at least one of the regions of the ~~labeled~~ region adjacency graph ~~being associated~~ with one of a plurality of predetermined semantic labels to provide a labeled region adjacency graph;

classification providing means for providing a plurality of predetermined stereotype classifications, each of the stereotype classifications corresponding to at least one predetermined pattern, wherein each predetermined pattern comprises:

- (i) a set of labeled regions; or
- (ii) a set of labeled regions and corresponding adjacency

information; [[and]]

analyzing means for analyzing the labeled region adjacency graph to identify the presence of one or more patterns of labeled regions in the labeled region adjacency graph, wherein for each pattern of labeled regions identified in the labeled region adjacency graph as matching at least one of the predetermined patterns, said classification providing means assigns one ~~or more~~ of the predetermined stereotype classifications to the labeled region adjacency graph such that the assigned stereotype describes the plurality of regions of the digital image [[as]] and represents a classification of the digital image; and

storage means for storing the one or more assigned stereotype classifications and the digital image in one or more databases of digital images, wherein the digital image is retrievable from the one or more databases using the one or more assigned stereotype classifications.

Claim 67 (canceled)

Claim 68 (previously presented): The apparatus according to claim 66, wherein a stereotype is assigned to the digital image signal on the basis of the semantic label content of one or more regions in the labeled region adjacency graph.

Claim 69 (previously presented): The apparatus according to claim 66, wherein a stereotype is assigned to the digital image signal on the basis of the adjacency of a set of regions with specified labels in the labeled region adjacency graph.

Claim 70 (previously presented): The apparatus according to claim 66, wherein a stereotype is assigned to the digital image signal on the basis of the size of one or more regions with a specified label in the labeled region adjacency graph.

Claim 71 (previously presented): The apparatus according to claim 66, wherein a stereotype is assigned to the digital image signal on the basis of a label which represents a mean color of one or more regions in the labeled region adjacency graph.

Claim 72 (previously presented): The apparatus according to claim 66, wherein a stereotype is assigned to the digital image signal on the basis of a label which represents a mean color texture of one or more regions in the labeled region adjacency graph.

Claim 73 (previously presented): The apparatus according to claim 66, wherein the plurality of stereotypes are stored in an association lookup table.

Claim 74 (previously presented): The apparatus according to claim 66, wherein the stereotypes are represented in an hierarchical arrangement.

Claim 75 (previously presented): The apparatus according to claim 74, wherein each of the stereotypes has a hierarchical path.

Claim 76 (previously presented): The apparatus according to claim 66, wherein each of the stereotypes is represented by one of a plurality of icons.

Claim 77 (currently amended): The apparatus according to claim 66, ~~where the digital image is stored in a database of digital images and wherein the digital image can be retrieved~~ is retrievable from the database one or more databases using a keyword representing a stereotype.

Claim 78 (currently amended): The apparatus according to claim 66, ~~where the digital image is stored in a database of digital images and wherein the digital image can~~

~~be retrieved~~ is retrievable from the ~~database~~ one or more databases using a icon representing a stereotype.

Claim 79 (currently amended): The apparatus according to claim 66, ~~where the digital image is stored in a database of digital images and wherein the digital image can be retrieved~~ is retrievable from the ~~database~~ one or more databases using either a keyword or icon representing a generalization, or broader version, of a stereotype.

Claim 80 (currently amended): A computer program product comprising a computer readable medium having a computer program recorded for classifying a digital image signal, said computer program product comprising:

a segmenting module, for segmenting the digital image into a plurality of substantially homogeneous regions;

a processing module, for processing the plurality of regions to provide a ~~labeled~~ region adjacency graph for the digital image, the ~~labeled~~ region adjacency graph representing spatial adjacency between the plurality of regions of the digital image[[,]];

labeling at least one of the regions of the ~~labeled~~ region adjacency graph ~~being associated~~ with at least one of a plurality of predetermined semantic labels to provide a labeled region adjacency graph;

a classification providing module, for providing a plurality of predetermined stereotype classifications, each of the stereotype classifications corresponding to at least one predetermined pattern, wherein each predetermined pattern comprises:

(i) a set of labeled regions; or

(ii) a set of labeled regions and corresponding adjacency

information; [[and]]

an analyzing module, for analyzing the labeled region adjacency graph to identify the presence of one or more patterns of labeled regions in the labeled region adjacency graph, wherein for each pattern of labeled regions identified in the labeled region adjacency graph as matching at least one of the predetermined patterns, said classification providing [[step]] module assigns ~~assigning~~ one ~~or more~~ of the predetermined stereotype classifications to the labeled region adjacency graph such that the assigned stereotype describes the plurality of regions of the digital image [[as]] and represents a classification of the digital image; and

a storage module, for storing the one or more assigned stereotype classifications and the digital image in one or more databases of digital images, wherein the digital image is retrievable from the one or more databases using the one or more assigned stereotype classification.

Claim 81 (canceled)

Claim 82 (previously presented): The computer program product according to claim 80, wherein a stereotype is assigned to the digital image signal on the basis of the semantic label content of one or more regions in the labeled region adjacency graph.

Claim 83 (previously presented): The computer program product according to claim 80, wherein a stereotype is assigned to the digital image signal on the basis of the adjacency of a set of regions with specified labels in the labeled region adjacency graph.

Claim 84 (previously presented): The computer program product according to claim 80, wherein a stereotype is assigned to the digital image signal on the basis of the size of one or more regions with a specified label in the labeled region adjacency graph.

Claim 85 (previously presented): The computer program product according to claim 80, wherein a stereotype is assigned to the digital image signal on the basis of a label which represents a mean color of one or more regions in the labeled region adjacency graph.

Claim 86 (previously presented): The computer program product according to claim 80, wherein a stereotype is assigned to the digital image signal on the basis of a label which represents a mean color texture of one or more regions in the labeled region adjacency graph.

Claim 87 (previously presented): The computer program product according to claim 80, wherein the plurality of stereotypes are stored in an association lookup table.

Claim 88 (previously presented): The computer program product according to claim 80, wherein the stereotypes are represented in an hierarchical arrangement.

Claim 89 (previously presented): The computer program product according to claim 88, wherein each of the stereotypes has a hierarchical path.

Claim 90 (previously presented): The computer program product according to claim 80, wherein each of the stereotypes is represented by one of a plurality of icons.

Claim 91 (currently amended): The computer program product according to claim 80, ~~wherein the digital image is stored in a database of digital images and~~ wherein the digital image ~~can be retrieved~~ is retrievable from the one or more databases using a keyword representing a stereotype.

Claim 92 (currently amended): The computer program product according to claim 80, ~~wherein the digital image is stored in a database of digital images and~~ wherein the digital image ~~can be retrieved~~ is retrievable from the one or more databases using a icon representing a stereotype.

Claim 93 (currently amended): The computer program product according to claim 80, ~~wherein the digital image is stored in a database of digital images and~~ wherein the digital image ~~can be retrieved~~ is retrievable from the database one or more databases using either a keyword or icon representing a generalization, or broader version, of a stereotype.

Claim 94 (currently amended): A method of classifying a digital image, said method comprising the steps of:

segmenting the digital image into substantially homogeneous regions;

processing the regions to provide a labeled region adjacency graph for the digital image, the labeled region adjacency graph representing spatial adjacency between the regions of the digital image, at least one of the regions of the labeled region adjacency graph being associated with one of a plurality of predetermined semantic labels;

analyzing the labeled region adjacency graph to identify one or more predetermined patterns of the semantic labels in the labeled region adjacency graph; [[and]]

assigning one or more of a plurality of predetermined stereotypes to the digital image according to each identified predetermined pattern of the semantic labels in the labeled region adjacency graph, each identified predetermined pattern being based on a minimum size of the regions in the labeled region adjacency graph, ~~wherein~~ the plurality of predetermined stereotypes being represented by a multi-level structure with each of the predetermined stereotypes corresponds corresponding to at least one of the predetermined patterns such that the assigned stereotype represents a classification of the digital image;
and

storing the one or more assigned stereotypes and the digital image in one or more databases of digital images together with one or more hierarchical paths, the one or more hierarchical paths being based on the multi-level hierarchical structure, wherein the digital image is retrievable from the one or more databases using the one or more assigned stereotypes and hierarchical paths.

Claim 95 (new): A method of classifying a digital image, said method comprising the steps of:

segmenting the image into substantially homogeneous regions;

processing, the regions to provide a labeled region adjacency graph for the digital image, the labeled region adjacency graph representing spatial adjacency between the regions of the image, at least one of the regions of the labeled region adjacency graph being associated with one of a plurality of predetermined semantic labels;

analyzing the labeled region adjacency graph to identify one or more predetermined patterns of the semantic labels in the labeled region adjacency graph; and

assigning one or more of a plurality of predetermined stereotypes to the digital image according to each identified predetermined pattern of the semantic labels in the labeled region adjacency graph, each of the predetermined stereotypes corresponding to at least one of the predetermined patterns, such that each assigned stereotype represents a classification of the digital image, wherein the plurality of stereotypes are represented in a multi-level hierarchical tree-structure such that the digital image is retrievable from one or more databases of digital images upon selection of at least one of the assigned stereotypes using the multi-level hierarchical tree-structure.

Claim 96 (new): A method of classifying a digital image, said method comprising the steps of:

segmenting the image into substantially homogeneous regions;

processing the regions to provide a labeled region adjacency graph for the digital image, the labeled region adjacency graph representing spatial adjacency between the regions of the image, at least one of the regions of the labeled region adjacency graph being associated with one of a plurality of predetermined semantic labels;

analyzing the labeled region adjacency graph to identify one or more predetermined patterns of the semantic labels in the labeled region adjacency graph; and

assigning one or more of a plurality of predetermined stereotypes to the digital image according to each identified predetermined pattern of the semantic labels in the labeled region adjacency graph, each of the predetermined stereotypes corresponding to at least one of the predetermined patterns such that each assigned stereotype represents a classification of the digital image, wherein the plurality of stereotypes have a hierarchical arrangement adapted for representation as a navigable stereotype tree such that the digital image is retrievable from one or more databases of digital images upon selection of at least one of the assigned stereotypes using the stereotype tree.